

IN THE CLAIMS:

Please cancel Claims 6-8, 10-16, 22-24, and 26-55.

Please amend the claims as is indicated below:

1. (Amended) A method for detecting disconnection [and occlusion] of a patient tubing system of a pneumatically driven, electronically controlled ventilator system used to provide [for providing] breathing gas to a patient [during the exhalation phase of a breath cycle], [said] an exhalation phase of a breath cycle having a plurality of control intervals, comprising the steps of:

[delivering a flow of breathing gas to a patient during an inspiratory phase of a breath cycle;]

determining an onset of an exhalation phase of said breath cycle;

[suspending gas flow delivery to the patient tubing system during said exhalation phase of said breath cycle;]

monitoring exhalation flow and pressure in the patient tubing system during a plurality of control intervals of said exhalation phase of said breath cycle to determine

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whether a condition indicating disconnection of the patient tubing system has occurred;

[monitoring exhalation pressure in the patient tubing system during a plurality of control intervals of said exhalation phase of said breath cycle to determine whether a condition indicating occlusion of the patient tubing system has occurred;] and

generating a disconnection signal indicating disconnection of the patient tubing system responsive to said exhalation flow and said pressure in said patient tubing system [if said condition indicating occlusion of the patient tubing system has not occurred, and] if said condition indicating disconnection of the patient tubing system has occurred.

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2. (Amended) The method of Claim 1, wherein said tubing system includes an exhalation line, and said step of monitoring exhalation flow and pressure in the patient tubing system comprises sensing pressure and flow in said exhalation line, and declaring disconnection of the patient tubing system has occurred if, during a control interval, the pressure in the exhalation line is [less than or greater than] within a predetermined pressure range, and if exhalation flow is less than a predetermined flow threshold, for a contiguous period of consecutive control intervals within a predetermined initial period of time following onset of an exhalation phase.

3. (Amended) [The method of Claim 1,] A method for detecting

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disconnection of a patient tubing system of a pneumatically driven, electronically controlled ventilator system used to provide breathing gas to a patient, an exhalation phase of a breath cycle having a plurality of control intervals, comprising the steps of:

determining an onset of an exhalation phase of said breath cycle;

monitoring exhalation flow and pressure in the patient tubing system during a plurality of control intervals of said exhalation phase of said breath cycle to determine whether a condition indicating disconnection of the patient tubing system has occurred;

monitoring exhalation pressure in the patient tubing system during a plurality of control intervals of said exhalation phase of said breath cycle to determine whether a condition indicating occlusion of the patient tubing system has occurred; and

generating a disconnection signal indicating disconnection of the patient tubing system responsive to said exhalation flow and said pressure in said patient tubing system if said condition indicating occlusion of the patient tubing system has not occurred, and if said condition indicating disconnection of the patient tubing system has occurred;

wherein said tubing system includes an exhalation line, and said step of monitoring exhalation flow and pressure in the patient tubing system comprises sensing pressure and flow in said exhalation line, and declaring disconnection of the patient tubing system has occurred if, during a control interval, the pressure in the exhalation line is [less than or greater than] within a predetermined pressure range, and if exhalation flow

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is less than a disconnection flow limit threshold based upon a flow target and a predetermined disconnection sensitivity, for a contiguous period of consecutive control intervals within a predetermined initial period of time following onset of an exhalation phase.

4. (Amended) [The method of Claim 1, wherein said tubing system includes an exhalation line, and said step of monitoring exhalation flow and pressure in the patient tubing system comprises sensing flow in said exhalation line,] A method for detecting disconnection of a patient tubing system of a pneumatically driven, electronically controlled ventilator system used to provide breathing gas to a patient, comprising the steps of:

delivering a flow of breathing gas to a patient during an inspiratory phase of a breath cycle;

monitoring a desired flow target of breathing gas; and

declaring disconnection of the patient tubing system has occurred if [a] the desired flow target is greater than or equal to a maximum flow threshold, and the duration of a current inspiration is greater than or equal to a maximum allowed spontaneous inspiration time.

5. (Amended) [The method of Claim 1,] A method for detecting

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control intervals of said exhalation phase of said breath cycle; and

wherein said tubing system includes an exhalation line, and said step of monitoring exhalation flow and pressure in the patient tubing system comprises sensing flow in said exhalation line from the beginning of an inspiration to the beginning of an exhalation, determining an exhalation volume from the sensed flow from the beginning of the inspiration to the beginning of the exhalation, and declaring disconnection of the patient tubing system has occurred if the exhalation volume is less than the integral of the net flow from the beginning of inspiration to the beginning of exhalation with respect to time, multiplied by a proportional factor and a disconnection sensitivity factor, for three consecutive breaths.

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system comprising:

[means for delivering a flow of breathing gas to a patient during an  
inspiratory phase of a breath cycle;]

means for determining an onset of an exhalation phase of said breath cycle;

[means for suspending gas flow delivery to the patient tubing system during  
said exhalation phase of said breath cycle;]

means for monitoring exhalation flow and pressure in the patient tubing  
system during a plurality of control intervals of said exhalation phase of said breath cycle  
to determine whether a condition indicating disconnection of the patient tubing system  
has occurred;

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[means for monitoring exhalation pressure in the patient tubing system during a plurality of control intervals of said exhalation phase of said breath cycle to determine whether a condition indicating occlusion of the patient tubing system has occurred;] and

means for generating a disconnection signal indicating disconnection of the patient tubing system responsive to said exhalation flow and said pressure in said patient tubing system [if said condition indicating occlusion of the patient tubing system has not occurred, and] if said condition indicating disconnection of the patient tubing system has occurred.

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18. (Amended) The system of Claim 17, wherein said tubing system includes an exhalation line, and said means for monitoring exhalation flow and pressure in the patient tubing system comprises a pressure sensor connected to said exhalation line and a flow sensor connected to said exhalation line, and means for declaring disconnection of the patient tubing system has occurred if, during a control interval, the pressure in the exhalation line is within [less than or greater than] a predetermined pressure range, and if exhalation flow is less than a predetermined flow threshold, for a contiguous period of consecutive control intervals within a predetermined initial period of time following onset of an exhalation phase.

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19. (Amended) [The system of Claim 17,] A system for detecting disconnection of a patient tubing system of a pneumatically driven, electronically controlled ventilator system used to provide breathing gas to a patient, an exhalation phase of a breath cycle having a plurality of control intervals, comprising:

means for determining an onset of an exhalation phase of said breath cycle;

means for monitoring exhalation flow and pressure in the patient tubing system during a plurality of control intervals of said exhalation phase of said breath cycle;

and

wherein said tubing system includes an exhalation line, and said means for monitoring exhalation flow and pressure in the patient tubing system comprises a pressure sensor connected to said exhalation line and a flow sensor connected to said exhalation line, and means for declaring disconnection of the patient tubing system has occurred if, during a control interval, the pressure in the exhalation line is within [less than or greater than] a predetermined pressure range, and if exhalation flow is less than a disconnection flow limit threshold based upon a flow target and a predetermined disconnection sensitivity, for a contiguous period of consecutive control intervals within a predetermined initial period of time following onset of an exhalation phase.

20. (Amended) [The system of Claim 17, wherein said tubing system includes an exhalation line, and said means for monitoring exhalation flow and pressure



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in the patient tubing system comprises a flow sensor connected to said exhalation line,] A system for detecting disconnection of a patient tubing system of a pneumatically controlled ventilator system used to provide a desired flow target of breathing gas to a patient, comprising:

means for delivering a flow of breathing gas to a patient during an inspiratory phase of a breath cycle; and

means for declaring disconnection of the patient tubing system has occurred if a desired flow target is greater than or equal to a maximum flow threshold, and the duration of a current inspiration is greater than or equal to a maximum allowed spontaneous inspiration time.

21. (Amended) [The system of Claim 17,] A system for detecting disconnection of a patient tubing system of a pneumatically driven, electronically controlled ventilator system used to provide breathing gas to a patient, an exhalation phase of a breath cycle having a plurality of control intervals, comprising:

means for determining an onset of an exhalation phase of said breath cycle;

means for monitoring exhalation flow and pressure in the patient tubing system during a plurality of control intervals of said exhalation phase of said breath cycle;  
and

wherein said tubing system includes an exhalation line, and said means for

monitoring exhalation flow and pressure in the patient tubing system comprises a flow sensor connected to said exhalation line for measuring exhalation flow from the beginning of an inspiration to the beginning of an exhalation, means for determining an exhalation volume from the sensed flow from the beginning of the inspiration to the beginning of the exhalation, and means for declaring disconnection of the patient tubing system has occurred if the exhalation volume is less than the integral of the net flow from the beginning of inspiration to the beginning of exhalation with respect to time, multiplied by a proportional factor and a disconnection sensitivity factor, for three consecutive breaths.